

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 27 March 2001 (27.03.01)	
<b>International application No.</b> PCT/GB00/02588	<b>Applicant's or agent's file reference</b> TMG/P70648pc
<b>International filing date (day/month/year)</b> 05 July 2000 (05.07.00)	<b>Priority date (day/month/year)</b> 05 July 1999 (05.07.99)
<b>Applicant</b> YOUNG, Michael, John, Radley et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 02 February 2001 (02.02.01)

☐ in a notice effecting later election filed with the International Bureau on:  
 \_\_\_\_\_

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer S. Mafia Telephone No.: (41-22) 338.83.38
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# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>TMG/P70648pc</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 00/ 02588</b>	International filing date (day/month/year) <b>05/07/2000</b>	(Earliest) Priority Date (day/month/year) <b>05/07/1999</b>
Applicant  <b>YOUNG, Michael, John, Radley.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☒ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

**4. With regard to the title,**

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

**5. With regard to the abstract,**

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

- ☐ as suggested by the applicant.
- ☐ because the applicant failed to suggest a figure.
- ☒ because this figure better characterizes the invention.

2  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02588

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N7/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 37 09 404 A (SCHUBERT WERNER) 10 November 1988 (1988-11-10)	1-6, 9, 10
Y	column 4, line 2 - line 13; figure 1 ---	7
X	DE 43 12 264 A (SIEMENS AG) 20 October 1994 (1994-10-20) column 3, line 63 - column 4, line 9; figure 1 ---	1-6, 8-10
X	WO 93 19705 A (MASSACHUSETTS INST TECHNOLOGY) 14 October 1993 (1993-10-14) page 10, line 21 - page 11, line 5; figures 2, 3 ---	1-6, 8
Y	US 5 036 855 A (FRY FRANCIS J ET AL) 6 August 1991 (1991-08-06) column 5, line 22 - line 27; figure 2 column 5, line 50 - line 52 ---	7
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

18 September 2000

Date of mailing of the international search report

26/09/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
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Authorized officer

Mayer, E

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02588

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 759 162 A (OPPELT ARNULF ET AL) 2 June 1998 (1998-06-02) column 5, line 4 - line 35; figures 1,2 ---	1-6,8-10
A	US 5 507 790 A (WEISS WILLIAM V) 16 April 1996 (1996-04-16) abstract; figures 1,2 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02588

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
DE 3709404	A	10-11-1988		DE 3812838 A		02-11-1989
				DE 3812840 A		02-11-1989
DE 4312264	A	20-10-1994		WO 9423793 A		27-10-1994
				DE 59408477 D		12-08-1999
				EP 0693954 A		31-01-1996
				JP 8508432 T		10-09-1996
				US 5817021 A		06-10-1998
WO 9319705	A	14-10-1993		US 5501655 A		26-03-1996
US 5036855	A	06-08-1991		US 4858613 A		22-08-1989
				CA 1328680 A		19-04-1994
				CA 1332441 A		11-10-1994
				DE 68928515 D		05-02-1998
				DE 68928515 T		23-04-1998
				EP 0402410 A		19-12-1990
				JP 7038858 B		01-05-1995
				JP 3503610 T		15-08-1991
				WO 8907909 A		08-09-1989
				US 4955365 A		11-09-1990
US 5759162	A	02-06-1998		DE 4207463 A		23-09-1993
				WO 9317646 A		16-09-1993
				DE 59306276 D		28-05-1997
				EP 0630220 A		28-12-1994
				JP 7504339 T		18-05-1995
				US 5624382 A		29-04-1997
US 5507790	A	16-04-1996		NONE		

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TMG/P70648pc	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02588	International filing date (day/month/year) 05/07/2000	Priority date (day/month/year) 05/07/1999
International Patent Classification (IPC) or national classification and IPC A61N7/02		
Applicant YOUNG, Michael, John, Radley.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  02/02/2001	Date of completion of this report  20.07.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Stern, M  Telephone No. +49 89 2399 2239



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02588

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-7 as originally filed

**Claims, No.:**

1-12 as originally filed

**Drawings, sheets:**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/02588

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 11,12.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 11,12.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)

Yes: Claims



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/02588

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	No:	Claims	1-10
Inventive step (IS)	Yes:	Claims	--
	No:	Claims	--
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

**R garding S ction V:**

1. Of the documents cited in the international search report, the following will be addressed in the present report:

D1: DE-A-3 709 404  
D2: DE-A-4 312 264  
D3: WO-A-93/19 705  
D4: US-A-5 036 855

2. The application does not fulfil the requirement of novelty of Article 33(2) PCT for the following reasons.
  - 2.1 Each one of documents D1 to D4 discloses an apparatus for treatment of subcutaneous tissue comprising means to generator ultrasonic vibrations, means to focus said vibrations onto a focal point and means to move the focal point; see figure 1 in D1, D2 and D3, and figure 3 in D4. Hence, the subject-matter of claim 1 lacks novelty.
  - 2.2 The features of the dependent claims 2-10 are also known from these documents:
    - (a) Note, for example, that the embodiment of Fig. 1 of D1 comprises a plurality of moveable generators (shock-wave tube 1), each having a focusing lens 4 immediately adjacent the tube 1. Hence, D1 anticipates the devices of claims 2-5 and 8-10.
    - (b) The feature of a plano-concave aluminium lens according to claims 6 and 7 is also known from D4, column 5, lines 50-52; Fig. 3.
3. It also seems that the description of the present application does not contain further subject-matter which may satisfy the requirements of novelty or inventive step.

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
11 January 2001 (11.01.2001)

PCT

(10) International Publication Number  
**WO 01/02055 A1**

(51) International Patent Classification<sup>7</sup>: A61N 7/02

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(22) International Filing Date: 5 July 2000 (05.07.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
9915707.5 5 July 1999 (05.07.1999) GB

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(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ,  
BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE,  
ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP,  
KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD,  
MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD,  
SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ,  
VN, YU, ZA, ZW.

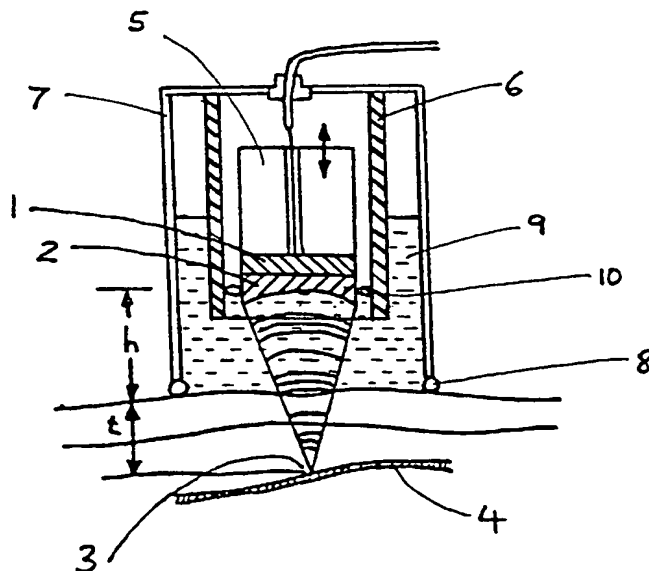
(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,  
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR FOCUSSED ULTRASONIC ENERGY



(57) Abstract: An apparatus for treatment of subcutaneous tissue comprising piezo electric generators (1) to generate ultrasonic vibrations. Each has a lens (2) to focus the ultrasonic vibration at a point (3) within the tissue. The focal point may be moved so that the generated ultrasonic vibrations may be focussed exactly at a point within the tissue which requires treatment. The energy enters the surface of the body over a very wide area, and therefore causes minimum damage to healthy overlying tissue.

WO 01/02055 A1

## **METHOD AND APPARATUS FOR FOCUSsing ULTRASONIC ENERGY**

The present invention relates to a method and apparatus for focussing ultrasonic energy. More particularly, but not exclusively, it relates to an apparatus and method for treatment of subcutaneous tissue utilising non-invasive focussed ultrasound.

Tissue which may be treated by the method and apparatus includes subcutaneous blood vessels, unsightly thread veins, selected cancer tissue, and the like. The apparatus may be used for haemostatic cutting and cauterising of blood vessels. It may also be used in other, non-medical, areas where it is desired to apply high intensity energy to a small target zone.

One tissue type which may benefit from such treatment comprises fine arteries and veins lying closely beneath the dermis.

It is well known that fine arteries and veins may become visible in quite random areas closely beneath the dermis. Where these are visible through the dermis in a localised area, these arteries or veins may constitute a serious visual skin blemish.

It is known to remove or treat such blood vessels either using laser energy or by forms of invasive surgery so that the blood supply to that particular part of the vascular system is permanently interrupted and the unsightly blemish may be removed.

However, such known methods of treatment may cause collateral damage to the tissue of the patient being treated or may require lengthy recovery periods.

Similarly, it is well known that certain types of cancerous cell may lie close beneath the surface, such as melanomas or even prostate cancers. Such cancers can sometimes be treated by means of laser irradiation, but there may be damage to surrounding tissue and to the outer layers of the dermis and this may be unacceptable.

It is an object of the present invention to provide a method and apparatus for treatment of subcutaneous tissue which obviates the above disadvantages.

According to a first aspect of the present invention, there is provided an apparatus for treatment of subcutaneous tissue comprising means to generate ultrasonic vibrations, means to focus said ultrasonic vibration at a point within said tissue, and means to move said focal point.

The apparatus may comprise a plurality of generator means to generate ultrasonic vibrations, each being provided with means to focus said ultrasonic vibration at said point within the tissue.

Preferably said means to focus said ultrasonic vibration at said point within tissue comprises lens means.

In the case where there are a plurality of generating means, each may be provided with a respective lens.

The or each lens may be plano-concave.

The or each lens may comprise titanium, titanium alloy, aluminium or an alloy thereof.

The or each lens may be disposed immediately adjacent the respective generator means.

The lens means may be so mounted that the location of the focal point thereof may be moved to impinge directly on the tissue to be treated.

Means to hold the lens means may be movable with respect to the body within which lies the tissue to be treated.

According to a second aspect of the present invention, there is provided a method of treatment of subcutaneous tissue comprising the steps of providing an apparatus as described above, applying said apparatus to a body within which lies the tissue to be treated, and

moving said ultrasonic generation means and said focussing means so that their effective distance from to the body within which lies the tissue to be treated is such that the focal point of the lens is coincident with the tissue to be treated.

The tissue to be treated may be subcutaneous blood vessels.

Embodiments of the present invention will now be more particularly described by way of example and with reference to the accompanying drawings, in which:-

**Figure 1** shows schematically a system for generating high intensity focused ultrasound;

**Figure 2** is a cross-sectional view of an apparatus utilising high intensity focused ultrasound for targeting on to a selected blood vessel;

**Figure 3** is a cross-sectional view of an apparatus including three ultrasonic generators; and

**Figure 4** is a plan view of the apparatus of Figure 3.

Referring now to Figure 1 and 2 of the drawings, a piezoelectric ceramic disc 1 is adapted to produce high frequency ultrasound in the 1-5 MHz range when excited at an appropriate frequency by electrical means (not shown). Immediately adjacent to the piezoelectric ceramic disc 1 is a focusing plano-concave lens 2 of aluminium alloy or titanium alloy or other suitable material, whereby the ultrasonic vibration is directed to a focal point 3 within the body wherein is located tissue, in this case a blood vessel 4, to be treated.

The focal point 3 may require to be moved to take account of the depth of the blood vessel 4 within the tissue, so that the focal point 3 of the ultrasonic vibration coincides with the vessel 4. This is achieved by moving the assembled piezoelectric disc 1 and lens 2 either towards or away from the surface of the tissue.

Movement is determined according to the formula:

$$f = h + t$$

where  $f$  is the focal length of lens 2;

$t$  is the depth of the target tissue 4 beneath the body surface; and

$h$  is the height of the lens 2 above the body surface.

Since  $f$  is a predetermined constant, for any variation in  $t$ ,  $h$  must be changed.

The assembly of piezoelectric disc 1 and lens 2 is mounted to an inner holder 5 which is itself held to be longitudinally movable with respect to an outer holder 6. A container 7 surrounds the outer holder 6 and is provided with a seal 8 to engage sealingly the body surface. The container 7 is adapted to hold a coupling fluid medium 9, at least filling that part of its volume separating the lens 2 from the body surface. The medium 9 is preferably a gelatinous or aqueous liquid capable of transmitting the ultrasonic vibrations between transmitting head assembly 1 and 2 and the body surface. A second seal 10 is provided between the relatively movable inner holder 5 and outer holder 6.

As may be seen, use of the invention enables direct absorption of substantially all generated ultrasonic vibrations at a target point within the tissue. This direct absorption of ultrasound in the 1 – 5 MHz range will cause the temperature of the relatively small volume of the target



tissue to rise rapidly, which will cause local coagulation of the vessel 4. Such treatment, when applied over an area of a visual skin blemish, should remove the offending blemishing vessels and improve the appearance of the area.

A further, more powerful, embodiment of the apparatus is shown in Figures 3 and 4. In this case, there are provided three ultrasonic generators 1, each associated with a respective plano-concave lens 2. Each of the three generator assemblies is attached by means of a bonding material 12 to a curved mounting plate 11. This mounting plate 11 forms one side of a liquid filled chamber 15, the other side of which is formed by a membrane 14 adapted to contact the surface of the body overlying the target tissue. The membrane 14 is sufficiently flexible to adapt itself to the shape of the body surface and the membrane material has good transmission for ultrasonic vibrations at the frequency (1 – 5 MHz) being used.

The apparatus including the three generator heads 1 is supported within a container 16 which enables the apparatus to be moved over the surface above the tissue to be treated.

As may be seen, each of the three generators 1 may individually be of comparatively low power intensity, but since all three are focused on the same point 3 within the tissue, the energy at that point 3 is markedly intensified- three times that of the intensity of any one of the individual already focussed beams. As is clear from the Figures, the intensity of the ultrasound at the surface of the body is very low, with any adverse effects minimised because of the wide area within which the beams enter the body. The intensity increases only gradually through the layers of dermis and epidermis to an intensely focus at point 3.

If so desired, more than three generator heads may be used, for example five in a cross configuration, seven in a circular configuration, or any number in any desired arrangement.

The use of the invention has been described by way of a method and apparatus to treat subcutaneous tissue, whether it is blood vessels or cancerous tissue. However, many other uses for the apparatus may be found, and it is not limited to a medical use.

CLAIMS

1. An apparatus for treatment of subcutaneous tissue comprising means to generate ultrasonic vibrations, means to focus said ultrasonic vibration at a point within said tissue, and means to move said focal point.
2. An apparatus as claimed in claim 1, wherein there is provided a plurality of generator means to generate ultrasonic vibrations, said plurality of generator means being provided with means to focus said ultrasonic vibration at said point within the tissue.
3. An apparatus as claimed in either claim 1 or claim 2, wherein said means to focus said ultrasonic vibration at a point within the tissue comprises lens means.
4. An apparatus as claimed in claim 2, wherein said plurality of generator means is provided with lens means to focus said ultrasonic vibrations at a single point within the tissue.
5. An apparatus as claimed in claim 4, wherein each of said plurality of generator means is provided with a respective lens means.
6. An apparatus as claimed in any one of claims 3 to 5, wherein the or each lens means is substantially plano-concave.
7. An apparatus as claimed in any one of claims 3 to 6, wherein the or each lens comprises titanium, an alloy thereof, aluminium or an alloy thereof.

8. An apparatus as claimed in any one of claims 3 to 7, wherein the or each lens means is disposed immediately adjacent the or a respective generator means.
9. An apparatus as claimed in any one of claims 3 to 8, wherein the or each lens means is so mounted that the effective location of the focal point thereof is movable to impinge directly on the tissue to be treated.
10. An apparatus as claimed in claim 9, wherein means to hold the lens means are movable with respect to the surface of the body above the tissue to be treated.
11. A method of treatment of subcutaneous tissue comprising the steps of providing an apparatus as claimed in any one of the preceding claims, applying said apparatus to a body within which lies the tissue to be treated, and moving said ultrasonic generation means and said focussing means so that their effective distance from the body surface above the tissue to be treated is such that the focal point of the lens is coincident with the tissue to be treated.
12. A method as claimed in claim 11, wherein the target tissue comprises blood vessels.

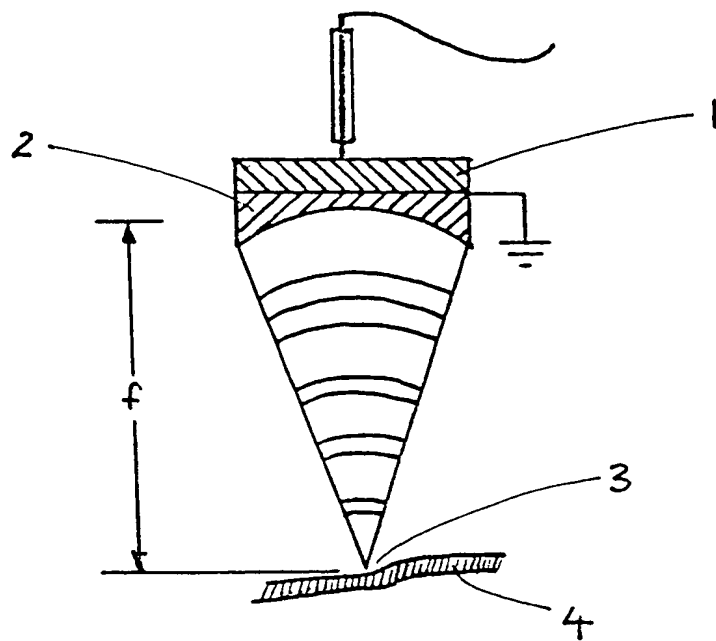


Fig 1

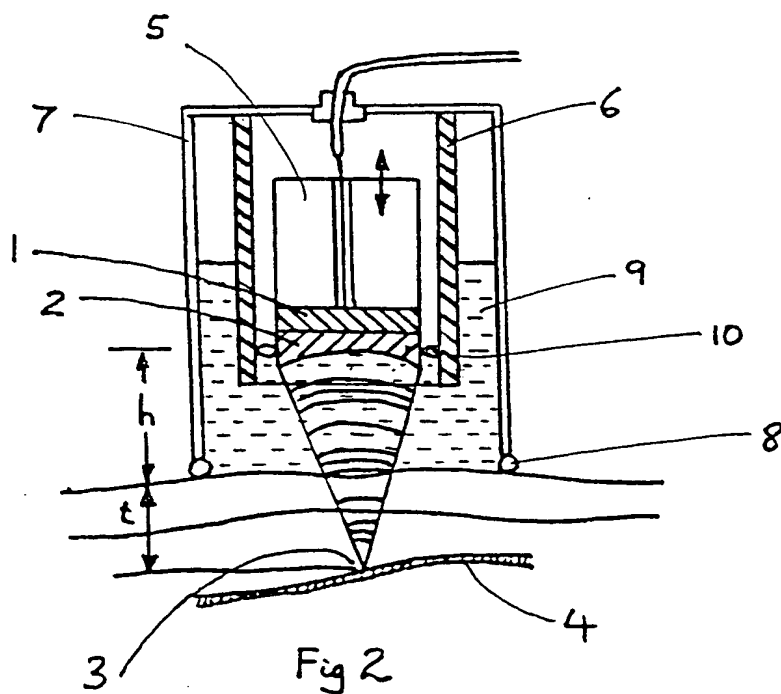
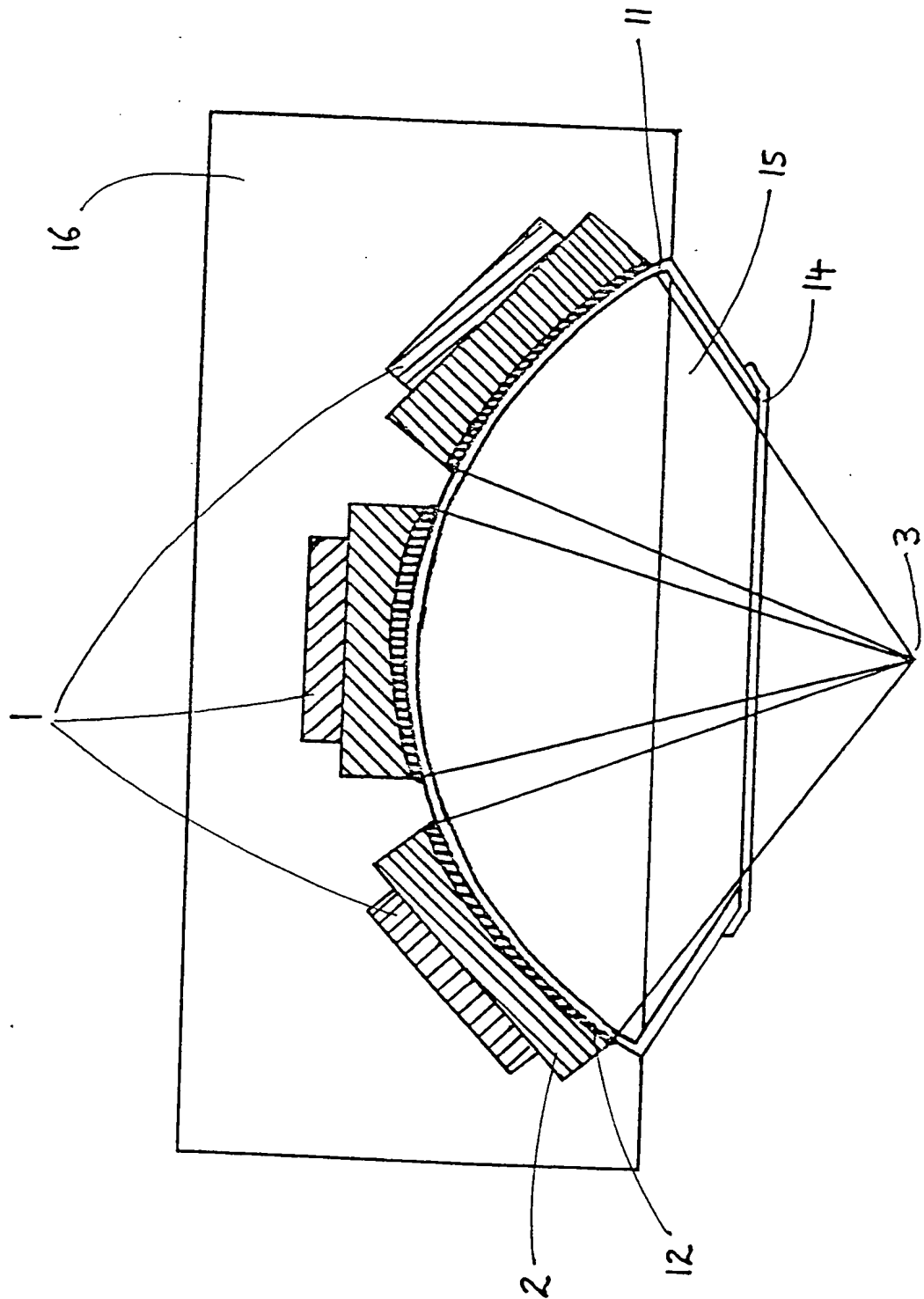


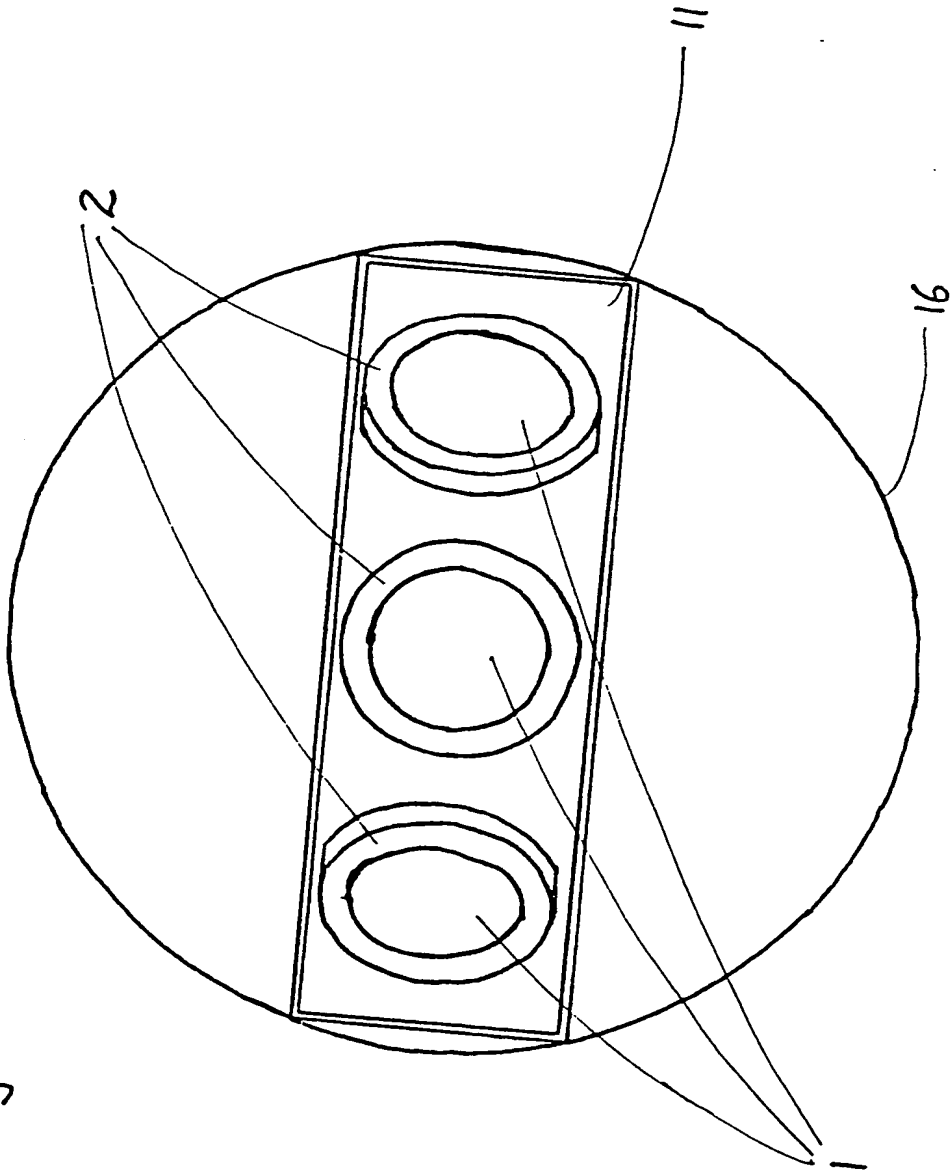
Fig 2

2/3



F. 9.3

Fig 4



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02588

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N7/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 37 09 404 A (SCHUBERT WERNER) 10 November 1988 (1988-11-10)	1-6,9,10
Y	column 4, line 2 - line 13; figure 1 ---	7
X	DE 43 12 264 A (SIEMENS AG) 20 October 1994 (1994-10-20) column 3, line 63 -column 4, line 9; figure 1 ---	1-6,8-10
X	WO 93 19705 A (MASSACHUSETTS INST TECHNOLOGY) 14 October 1993 (1993-10-14) page 10, line 21 -page 11, line 5; figures 2,3 ---	1-6,8
Y	US 5 036 855 A (FRY FRANCIS J ET AL) 6 August 1991 (1991-08-06) column 5, line 22 - line 27; figure 2 column 5, line 50 - line 52 ---	7
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

18 September 2000

Date of mailing of the international search report

26/09/2000

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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